

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP97/04598

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl.⁶ H01J11/02, H01J17/16, H01J9/02, H01J9/26, H01J9/395

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl.⁶ H01J11/02, H01J17/16, H01J17/48, H01J9/02, H01J9/24, H01J9/26, H01J9/28, H01J9/395, B05B7/22, C23C4/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-1998
 Kokai Jitsuyo Shinan Koho 1971-1998 Jitsuyo Shinan Toroku Koho 1996-1998

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 9357/1988 (Laid-open No. 113948/1989) (NEC Corp.),	1-2, 4-6, 11, 14, 22-24, 29-30, 33, 40
Y	July 31, 1989 (31. 07. 89), Full text ; Fig. 1 (Family: none)	10, 16, 18, 20, 36-38
A		3, 7-9, 12-13, 15, 19, 21, 25-28, 31-32, 34-35, 39
X	JP, 8-507645, A (Phillips Electronics N.V.), August 13, 1996 (13. 08. 96), Full text ; Fig. 1 & WO, 95/19027, A2	1, 17

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

- * Special categories of cited documents:
- *A* document defining the general state of the art which is not considered to be of particular relevance
 - *E* earlier document but published on or after the international filing date
 - *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 - *O* document referring to an oral disclosure, use, exhibition or other means
 - *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *Z* document member of the same patent family

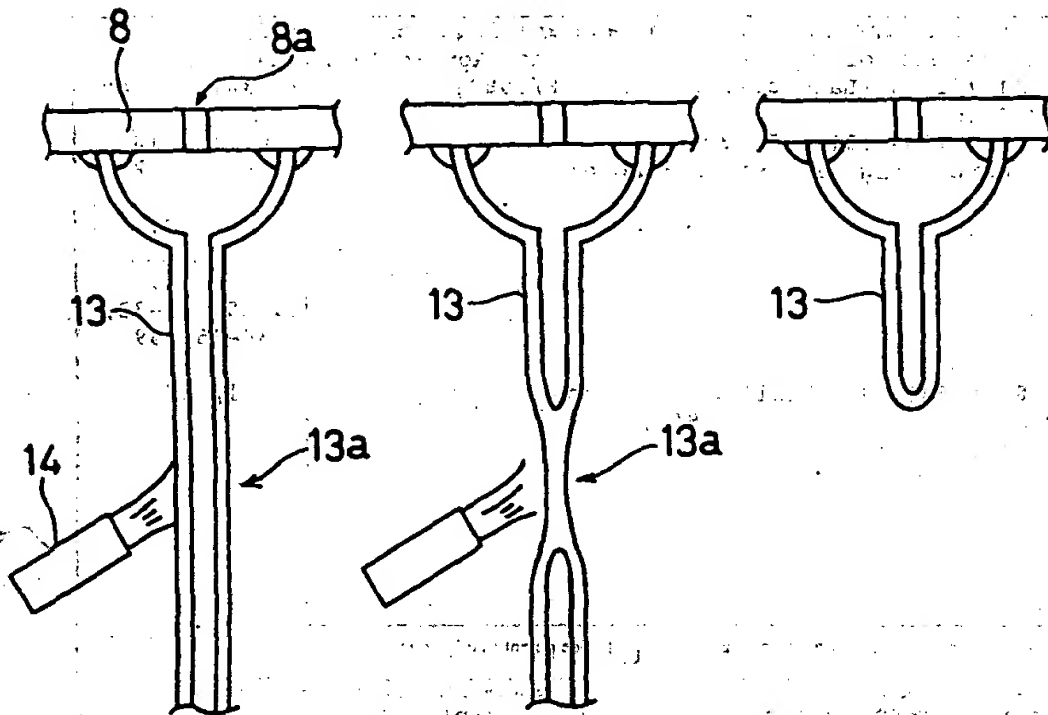
Date of the actual completion of the international search
March 31, 1998 (31. 03. 98)Date of mailing of the international search report
April 14, 1998 (14. 04. 98)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Fig. 22 Fig. 22 Fig. 22
(a) (b) (c)



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP97/04598

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 50-100967, A (Hitachi, Ltd.), August 11, 1975 (11. 08. 75), Page 1, lower left column, lines 10 to 17 ; page 2, upper right column, line 19 to lower left column, line 6 ; Fig. 4 & NL, 7411350, A & DE, 2440539, A1	3, 13, 32
Y	JP, 53-27360, A (Asahi Glass Co., Ltd.), March 14, 1978 (14. 03. 78), Page 3, lower left column, lines 1 to 18 ; page 4, upper right column, lines 2 to 16 ; Fig. 2 (Family: none)	16
Y	JP, 3-254041, A (Mitsubishi Electric Corp.), November 13, 1991 (13. 11. 91),	10, 18, 20
A	Page 2, upper right column, line 9 to lower right column, line 15 ; Fig. 1 (Family: none)	19, 21
A	JP, 2-242548, A (Dainippon Printing Co., Ltd.), September 26, 1990 (26. 09. 90), Page 2, upper right column, lines 1 to 16 ; Fig. 1 (Family: none)	3, 13, 32
A	JP, 54-158859, A (Fujitsu Ltd.), December 15, 1979 (15. 12. 79), Page 1, lower left column, lines 12 to 20 ; Fig. 1 (Family: none)	35
Y	JP, 50-159247, A (Fujitsu Ltd.), December 23, 1975 (23. 12. 75),	36-38
A	Full text ; Figs. 3, 4	39
A	JP, 60-64659, A (Toshiba Corp.), April 13, 1985 (13. 04. 85), Full text (Family: none)	9, 25-28, 34
A	JP, 8-171863, A (Taiyo Ink Mfg. Co., Ltd.), July 2, 1996 (02. 07. 96), Par. No. [0005] ; Fig. 1 (Family: none)	26, 27

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

09/786692

JO Rec'd PCT/PTO 07 MAR 2001

PRICE AND GESS

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COPY OF PCT SEARCH REPORT

Inventor(s): Junichi Hibino et al.

Title: A DISPLAY AND MANUFACTURING METHOD FOR
THE SAME INCLUDING IMPROVED BONDING AGENT
APPLICATION METHOD

Attorney's
Docket No.: NAK1-BO16

EXPRESS MAIL LABEL NO. EM147975087US

DATE OF DEPOSIT: March 7, 2001

ENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P21402-P0	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/JP 99/ 04855	International filing date (day/month/year) 08/09/1999	(Earliest) Priority Date (day/month/year) 08/09/1998
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☒ Unity of invention is lacking (see Box II).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

DISPLAY PANEL AND MANUFACTURING METHOD FOR THE SAME INCLUDING BONDING AGENT APPLICATION METHOD

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

3

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP 99/04855

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

/JP 99/04855

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01J9/26 H01J9/24 H01J17/49

IPC 7 H01J

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 27571 A (AOKI MASAKI ;MURAI RYUICHI (JP); SUZUKI SHIGEO (JP); YASUI HIDEAKI) 25 June 1998 (1998-06-25) cited in the application	1,20,21, 24,27, 36,39
X		53-56,59
Y	& EP 0 945 886 A (MATSUSHITA ELECTRIC IND CO) 29 September 1999 (1999-09-29) column 12, line 35 -column 13, line 42 column 14, line 24 -column 15, line 1 column 28, line 2 - line 39; figures 1,3,16 ---	44-52
Y	US 5 742 122 A (TESHIROGI HITOSHI ET AL) 21 April 1998 (1998-04-21) column 4, line 45 -column 6, line 26; figures 2,4 ---	44-52

	-/--	

☒ Patent family members are listed in annex.

"&" document member of the same patent family

02.06.00

Schaub, G.

INTERNATIONAL SEARCH REPORT

International Application No

T/JP 99/04855

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 814 491 A (MOTOROLA INC) 29 December 1997 (1997-12-29)	1
X	column 4, line 26 - line 55; figures ----	53-56, 59
A	FR 2 686 984 A (FUTABA DENSHI KOGYO KK) 6 August 1993 (1993-08-06) abstract; figures ----	1
A	EP 0 789 384 A (SPECTRON CORP OF AMERICA LLC) 13 August 1997 (1997-08-13) column 13, line 19 - line 26 ----	56, 57
A	EP 0 782 167 A (PIONEER ELECTRONIC CORP) 2 July 1997 (1997-07-02) column 17, line 50 - column 21, line 53; figures 9-16 ----	44, 45
A	DE 195 42 426 A (SAMSUNG DISPLAY DEVICES CO LTD) 30 May 1996 (1996-05-30) column 4, line 1 - line 32; figures 1-4 -----	44

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-43, 53-59

display panel wherein front and rear plate substrates are connected together via barrier ribs; several methods for depositing a bonding agent on top of each rib and/or patterning the ribs-bonding agent system

2. Claims: 44-52

gas discharge display panel structured so that discharges occur in areas away from areas where barrier ribs are bonded to opposite substrate

INTERNATIONAL SEARCH REPORT

ation on patent family members

International Application No

JP 99/04855

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9827571	A	25-06-1998	EP	0945886 A	29-09-1999
			JP	11204040 A	30-07-1999
US 5742122	A	21-04-1998	JP	8250029 A	27-09-1996
EP 0814491	A	29-12-1997	US	5811927 A	22-09-1998
			JP	10083778 A	31-03-1998
FR 2686984	A	06-08-1993	JP	2596279 B	02-04-1997
			JP	5205640 A	13-08-1993
			US	5385499 A	31-01-1995
EP 0789384	A	13-08-1997	US	5469021 A	21-11-1995
			AU	6961094 A	20-12-1994
			CA	2164429 A	08-12-1994
			EP	0701736 A	20-03-1996
			JP	8511126 T	19-11-1996
			WO	9428570 A	08-12-1994
			US	5654727 A	05-08-1997
			US	5634836 A	03-06-1997
			US	5954560 A	21-09-1999
EP 0782167	A	02-07-1997	JP	9237580 A	09-09-1997
			US	6037916 A	14-03-2000
			US	5877734 A	02-03-1999
DE 19542426	A	30-05-1996	FR	2727243 A	24-05-1996
			JP	2862824 B	03-03-1999
			JP	8222136 A	30-08-1996
			US	5717291 A	10-02-1998

09/786692

JC [redacted] PCT/PTO 07 MAR 2001

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**COPY OF PCT INTERNATIONAL PRELIMINARY EXAMINATION
REPORT**

Inventor(s): Junichi Hibino et al.

Title: A DISPLAY AND MANUFACTURING METHOD FOR
THE SAME INCLUDING IMPROVED BONDING AGENT
APPLICATION METHOD

Attorney's
Docket No.: NAK1-BO16

EXPRESS MAIL LABEL NO. EM147975087US

DATE OF DEPOSIT: March 7, 2001

PATENT COOPERATION TREATY



From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Rule 71.1)

To:

NAKAJIMA, Shiro
6F, Yodogawa 5-Bankan, 2-1,
Toyosaki 3-chome, Kita-ku
Osaka-shi, Osaka 531-0072
JAPON

Date of mailing
(day/month/year) 21.12.2000

Applicant's or agent's file reference
P21402-P0

IMPORTANT NOTIFICATION

International application No.
PCT/JP99/04855

International filing date (day/month/year)
08/09/1999

Priority date (day/month/year)
08/09/1998

Applicant
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



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Authorized officer

Wolinski, A

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09/786692

JCOB Rec'd PCT/PTO 07 MAR 2001

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COPY OF PCT WRITTEN OPINION

Inventor(s): Junichi Hibino et al.

Title: A DISPLAY AND MANUFACTURING METHOD FOR
THE SAME INCLUDING IMPROVED BONDING AGENT
APPLICATION METHOD

Attorney's
Docket No.: NAK1-BO16

EXPRESS MAIL LABEL NO. EM147975087US

DATE OF DEPOSIT: March 7, 2001

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

NAKAJIMA, Shiro
6F, Yodogawa 5-Bankan, 2-1,
Toyosaki 3-chome, Kita-ku
Osaka-shi, Osaka 531-0072
JAPON

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing (day/month/year) 18.08.2000	
Applicant's or agent's file reference P21402-P0	REPLY DUE within 2 month(s) from the above date of mailing
International application No. PCT/JP99/04855	International filing date (day/month/year) 08/09/1999
Priority date (day/month/year) 08/09/1998	
International Patent Classification (IPC) or both national classification and IPC H01J9/26	
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.	

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☒ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☒ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 08/01/2001.

Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer / Examiner Lang, T Formalities officer (incl. extension of time limits) Schuster-Kaechele, W Telephone No. +49 89 2399 2281
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I. Basis of the opinion

1. This opinion has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed")*:

Description, pages:

1-87 as originally filed

Claims, No.:

1-59 as originally filed

Drawings, sheets:

1/35-35/35 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation (Form PCT/IPEA/405) to restrict or pay additional fees, the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with for the following reasons

and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees:

3. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this opinion:

☒ all parts.

☐ the parts relating to claims Nos. .

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	24, 44-47, 49, 50, 53, 55-59
Inventive step (IS)	Claims	1-19, 21, 23-32, 34-59
Industrial applicability (IA)	Claims	-

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

The application lacks unity within the meaning of Rule 13.1 PCT for the reasons set out in the invitation dated 4.7.2000.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1) Reference in made to the following documents:

- D1: EP-A-0 814 491 (MOTOROLA INC) 29 December 1997 (1997-12-29)
- D2: WO 98 27571 A (AOKI MASAKI; MURAI RYUICHI (JP); SUZUKI SHIGEO (JP); YASUI HIDEAKI) 25 June 1998 (1998-06-25) &
- D2a: EP 0 945 886 A (MATSUSHITA ELECTRIC IND CO) 29 September 1999 (1999-09-29), which is used for the interpretation of D2 since it belongs to the same patent family
- D3: US-A-5 742 122 (TESHIROGI HITOSHI ET AL) 21 April 1998 (1998-04-21)
- D4: EP-A-0 789 384 (SPECTRON CORP OF AMERICA LLC) 13 August 1997 (1997-08-13)
- D5: EP-A-0 782 167 (PIONEER ELECTRONIC CORP) 2 July 1997 (1997-07-02)
- D6: EP 0836892 A
- D7: FR 2738393 A
- D8: EP 0837486 A
- D9: McGraw-Hill Concise Encyclopedia of Science & Technology (S. Parker, ed.); McGraw-Hill Book Company, New York 1984; page 1386.

The documents **D6-D9** were not cited in the international search report. Copies of these documents are appended hereto.

2) Novelty (Article 33(2) PCT)

The subject-matter of independent **claims 24, 44, 53, and 59** is not new:

2.1) The subject-matter of **claim 24** is not new over the disclosure of **D2** (see Fig. 16 and D2a paragraph 153 (column 28): bonding agent 15 is arranged in indentations formed on the top of the barrier ribs 7).

2.2) The subject-matter of **claim 44** is not new over the disclosure of **D5** (see abstract, column 7 line 25 to column 8 line 38; Fig. 1, 6, 9, 11, 13, and 16; column 17 line 50 to column 21 line 53):

In the sustaining discharge mode, the discharge spreads over the electrode pairs Xi, Yi (see e.g. column 19 lines 35-39, column 18 lines 32-35, Fig. 6), whereas the reset discharge is even more restricted. Since most part of these electrodes is at a distance from the barrier ribs 126 in Fig. 9, 11, 13 and 16, the discharge (both reset and sustaining) mainly occurs in parts of the panel which are separated from the positions where the barrier ribs 126 and the dielectric layer 132 are connected by mechanical contact (once front and back surface of the panel are bonded together, and because of the subatmospheric filling pressure of 400-600 Torr, the ribs and the dielectric layer necessarily contact each other).

2.3) For essentially the same reasons, the subject-matter of **claim 44** is equally not new over the disclosure of **D3** (see abstract, Fig. 1 to 4; column 4 line 46 to column 6 line 26: the discharge mainly occurs in a region G, Fig. 3 and column 4 line 63; the ribs 31 and the dielectric layer 24 are in contact, column 6 line 18).

2.4) The subject-matter of **claim 53** is not new over the disclosure of **D2** (see Fig. 6 and D2a paragraphs 91, 92; Fig. 13 and paragraph 139 as well as Fig. 17 and paragraph 165: 450°C, or the melting point of lead oxide or frit glass, is lower than the melting point of division walls 7 (see also paragraphs 37 and 174: alumina)).

2.5) The subject-matter of **claim 53** is equally not new over the disclosure of **D1** (see abstract, column 4 lines 26-55, and figures).

2.6) The subject-matter of **claim 59** is not new over the disclosure of **D2** (see D2a paragraph 139: ceramics is more difficult to melt than lead oxide).

3) Inventive Step (Article 33(3) PCT)

The subject-matter of independent **claims 1, 21, 27, 36, and 39** does not involve an inventive step:

3.1) Document **D2** (see abstract, Fig. 1, 6; paragraphs 34-42, 104, 156-157) discloses a display panel manufacturing process, comprising the connection process of present claim 1, and applying a bonding agent to almost an entire top surface of each barrier rib by screen printing (D2a paragraphs 104 and 157) .

It belongs, however, to general knowledge (see D9 page 1386) that in screen printing a holding member (printing frame) holds a paste to be printed to form an application surface for the paste which is brought into contact with the surface to be printed on, while the degree of contact of the paste with the latter surface is regulated by a squeegee.

Thus the skilled person arrives at the subject matter of **claim 1** by applying standard knowledge, without involving an inventive step.

3.2) Document **D2** also discloses arranging the bonding agent on the barrier ribs by lift-off (paragraphs 104, 156).

It is a trivial design possibility to perform the lift-off of the bonding agent from a sheet, thereby arriving at the subject-matter of **claim 36** without involving an inventive activity.

3.3) Document **D2** discloses the subject-matter of **claim 21** except for the feature that the barrier rib pattern is formed by pressing. (See in particular D2a paragraph 157, which teaches that the bonding agent is applied (by a not specified means or member) which has the same pattern as the barrier ribs. Claim 21 does not restrict in any way the pattern forming member).

Forming the barrier ribs of a display panel by pressing is however a well-known process (see **D6** page 12 line 17, **D7** abstract, **D8** abstract), which is functionally unrelated to the bonding process. The subject-matter of claim 21 thus amounts to a mere juxtaposition of known features which is not based on an inventive activity (cf. PCT International Preliminary Examination Guidelines IV-8.3a).

3.4) The subject-matter of **claim 27** does not involve an inventive step over the disclosure of **D2**, for essentially the same reasons as given in conjunction with claim 1 above:

In screen printing, holes are formed in a first member (printing stencil) by a first removing process in order to provide the printing pattern. During printing, the member is attached to the surface which is printed on and the printing paste fills the holes, and after printing the remaining (i.e. patterned with holes) member is removed.

The subject matter of claim 27 is thus arrived at when following the teaching of **D2** to apply the bonding agent by screen printing, without involving an inventive step.

3.5) The subject-matter of **claim 39** does not involve an inventive step over the disclosure of **D2**, see in particular **D2a** paragraph 92 which teaches to apply an UV adhesive to selected regions of the ribs.

It is, however, routine photolithography practice to first coat an entire surface, harden selected regions of the surface by UV, and to remove the parts which were not hardened. The skilled person would routinely apply this standard practice when following the teaching of **D2**, thereby arriving at the subject-matter of claim 39 in an obvious manner.

3.6) Even if delimited against **D3** or **D5** by specifying that the barrier ribs are bonded to the dielectric layer, the subject-matter of **claim 44** would not involve an inventive step since it is obvious to apply the teaching of **D2** (to bond these parts together) to the display panels of **D3** or **D5** (as cited above).

4) Articles 33(2) and (3) PCT

At the present understanding, dependent **claims 2-19, 23, 25, 26, 28-32, 34, 35, 37, 38, 40-43, 45-52, and 54-58** only comprise subject-matter relating to features which are either known, explicitly or implicitly, from the citations or considered to be routine matter to be expected of the skilled person. Therefore these claims cannot serve as a basis for a new independent claim which meets the requirements of the PCT with respect to novelty and inventive step.

The subject-matter of claims 45-47, 49, 50, and 55-58 is even not new over the prior art documents cited with respect to the claims these claims depend on (i.e. D3 or D5; D2).

The unclear features in claims 2-6 and 23 (see item VIII below) cannot be used to distinguish the invention from the prior art (cf. PCT International Preliminary Examination Guidelines III-4.5a).

Re Item VIII

Certain observations on the international application

1) Lack of clarity and descriptive support (Art. 6 PCT)

1.1) The distance between the bonding agent and a barrier rib is necessarily zero when they are brought into contact.

Since there is contact between the bonding agent and the barrier ribs in **claims 2, 3, 4, and 5**, it is unclear what is meant by distance, or by relative position, between the bonding agent (which part of it ?) and the barrier ribs; and how this distance or relative position could be controlled or regulated.

1.2) It is not supported in the description that the "ninth step" in **claim 6** (which depends on claim 4) is performed in addition to the "seventh step" of bringing into contact barrier ribs and bonding agent in claim 4.

1.3) In **claim 23** the expression "the pattern forming member used in claim 21" is unclear since

- there are two pattern forming members in claim 21; it is unclear which is meant; and
- the use (in claim 21) of a pattern forming member does not characterise the member itself.

Although claim 23 appears to be intended as dependent on claim 21, this is not sufficiently indicated by only referring to a single feature of claim 21.

1.4) It is noted that any amendments have to comply strictly to the requirements of Article 34(2)(b) PCT.

2) Lack of conciseness (Art. 6 PCT)

2.1) Although **claims 1 and 36** have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter.

These claims therefore lack conciseness and do not meet the requirements of Article 6 PCT.

2.2) For the same reasons, independent **claims 24 and 27** lack conciseness and do not meet the requirements of Article 6 PCT.

2.3) **Claim 8** is a duplicate of claim 7 and therefore not concise.

2.4) **Claim 10** is a duplicate of claim 9 and therefore not concise.

2.5) **Claims 16-19** are duplicates of claim 15 and therefore not concise.

2.6) **Claim 32** is a duplicate of claim 31 and therefore not concise.

2.7) **Claim 58** is a duplicate of claim 57 and therefore not concise.

Re Item VII

Certain defects in the international application

1) The applicant is invited to file new claims which take into account of the objections in this communication.

At the present understanding of the application, the subject-matter of claims 20, and the combined subject-matter of claims 33 and 27 might meet the requirements of the PCT with respect to novelty (Art. 33(2) PCT) and inventive step (Art. 33(3) PCT).

From the present wording of the other claims, the examiner cannot see what is the contribution of the claimed invention to the prior art, i.e. what are the new and inventive features which distinguish the claimed invention from the prior art.

The applicant should therefore indicate in the letter of reply the difference of the subject-matter of the new claim(s) vis-à-vis the state of the art (**reasons for novelty**) and the significance thereof (**reasons for inventive step**).

2) Independent device claim(s) should be formulated such that features known in combination from the prior art are placed in the preamble of these claims in accordance with (Rule 6.3(b)(i-ii) PCT).

3) The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

4) When filing amended claims the applicant should at the same time bring the description into conformity with the amended claims.

Any embodiments no longer falling within the scope of the claims should be excised from the description and drawings or renamed as examples not forming part of the invention.

Care should be taken during revision, especially of the introductory portion and any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed (Article 34 (2) (b) PCT).

5) The relevant background art disclosed in the documents **D1, D2, D3, D6, and D7** is not mentioned in the description, nor are these documents identified therein (Rule 5.1(a)(ii) PCT).

The applicant should ensure that it is clear from the description which features of the subject-matter of the independent claim(s) are known from the prior art.

6) The units of measure "Torr" employed in claims 52, 57 and 58 and on pages 2, 3, 22, 31 and 68 are not additionally expressed in terms of the units stipulated by Rule 10.1 (a) PCT.

7) In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based.

The applicant is asked to file amendments by way of replacement pages in the manner stipulated by Rule 66.8(a) PCT. In particular, fair copies of the amendments should be filed preferably in triplicate.

Moreover, the applicant's attention is drawn to the fact that, as a consequence of Rule 66.8(a) PCT the examiner is not permitted to carry out any amendments under the PCT procedure, however minor these may be.

09/786692
JC08 Rec'd PCT/PTO 07 MAR 2001

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COPY OF PCT REQUEST

Inventor(s): Junichi Hibino et al.

Title: A DISPLAY AND MANUFACTURING METHOD FOR
THE SAME INCLUDING IMPROVED BONDING AGENT
APPLICATION METHOD

Attorney's
Docket No.: NAK1-BO16

EXPRESS MAIL LABEL NO. EM147975087US

DATE OF DEPOSIT: March 7, 2001

PCT REQUEST

P21402-P0

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0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.91 (updated 01.01.2001)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Japanese Patent Office (RO/JP)
0-7	Applicant's or agent's file reference	P21402-P0
I	Title of invention	A DISPLAY PANEL AND MANUFACTURING METHOD FOR THE SAME INCLUDING IMPROVED BONDING AGENT APPLICATION METHOD
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
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II-7	State of residence	JP
II-8	Telephone No.	06-6908-5831
II-9	Facsimile No.	06-6906-8766
III-1	Applicant and/or inventor	
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III-1-2	Applicant for	US only
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III-1-5	Address:	919-1-A712, Utiage Neyagawa-shi, Osaka 572-0802, Japan
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III-1-7	State of residence	JP

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III-6-7	State of residence	JP

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III-7	Applicant and/or inventor	
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III-11-7	State of residence	JP

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III-12	Applicant and/or Inventor	
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III-12-7	State of residence	JP
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III-14	Applicant and/or Inventor	
III-14-1	This person is:	applicant and inventor
III-14-2	Applicant for	US only
III-14-4	Name (LAST, First)	TANAKA, Hiroyosi
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III-14-6	State of nationality	JP
III-14-7	State of residence	JP
IV-1	Agent or common representative; or address for correspondence	
	The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	NAKAJIMA, Shiro
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IV-1-4	Facsimile No.	06-6373-3105
IV-1-5	e-mail	nakapate@cap.bekkoame.or.jp

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V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	EP: DE FR GB
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	CN KR US
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date	08 September 1998 (08.09.1998)
VI-1-2	Number	Patent Application No.10-253553
VI-1-3	Country	JP
VI-2	Priority claim of earlier national application	
VI-2-1	Filing date	16 September 1998 (16.09.1998)
VI-2-2	Number	Patent Application No.10-261156
VI-2-3	Country	JP
VI-3	Priority claim of earlier national application	
VI-3-1	Filing date	28 September 1998 (28.09.1998)
VI-3-2	Number	Patent Application No.10-274072
VI-3-3	Country	JP
VI-4	Priority claim of earlier national application	
VI-4-1	Filing date	05 October 1998 (05.10.1998)
VI-4-2	Number	Patent Application No.10-282421
VI-4-3	Country	JP
VI-5	Priority claim of earlier national application	
VI-5-1	Filing date	08 October 1998 (08.10.1998)
VI-5-2	Number	Patent Application No.10-286248
VI-5-3	Country	JP

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VI-6	Priority claim of earlier national application		
VI-6-1	Filing date	02 March 1999 (02.03.1999)	
VI-6-2	Number	Patent Application No.11-054781	
VI-6-3	Country	JP	
VI-7	Priority claim of earlier national application		
VI-7-1	Filing date	12 March 1999 (12.03.1999)	
VI-7-2	Number	Patent Application No.11-066408	
VI-7-3	Country	JP	
VI-8	Priority claim of earlier national application		
VI-8-1	Filing date	02 June 1999 (02.06.1999)	
VI-8-2	Number	Patent Application No.11-155152	
VI-8-3	Country	JP	
VI-9	Priority document request		
	The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1, VI-2, VI-3, VI-4, VI-5, VI-6, VI-7, VI-8	
VII-1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	7	-
VIII-2	Description	87	-
VIII-3	Claims	17	-
VIII-4	Abstract	1	p21402-p0.txt
VIII-5	Drawings	35	-
VIII-7	TOTAL	147	
	Accompanying Items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-9	Separate signed power of attorney	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Request for transmittal of priority document	-
VIII-17	Other (specified):	Payment form bearing revenue stamps for appropriate fee	-
VIII-18	Figure of the drawings which should accompany the abstract	3	
VIII-19	Language of filing of the International application	English	

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 26 April 2000 (26.04.00)	in its capacity as elected Office
International application No. PCT/JP99/04855	Applicant's or agent's file reference P21402-P0
International filing date (day/month/year) 08 September 1999 (08.09.99)	Priority date (day/month/year) 08 September 1998 (08.09.98)
Applicant HIBINO, Junichi et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

20 March 2000 (20.03.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was ☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer</p> <p>Antonia Muller</p> <p>Telephone No.: (41-22) 338.83.38</p>
---	--

PATENT COOPERATION TREATY

PCT



REC'D 27 DEC 2000

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P21402-P0		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/JP99/04855	International filing date (day/month/year) 08/09/1999	Priority date (day/month/year) 08/09/1998	
International Patent Classification (IPC) or national classification and IPC H01J9/26			
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 19 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 45 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input checked="" type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 20/03/2000		Date of completion of this report 21.12.2000	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Lang, T Telephone No. +49 89 2399 2594 	

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/JP99/04855

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1,4,6,21,23-30,32-61, as originally filed
63-67,69-87

2,3,3a,5,5a-5b,7, as received on 16/10/2000 with letter of 16/10/2000
9-15,15a,16-18,18a,
19,20,22,31,62,
68

Claims, No.:

44 (part),45-48 as originally filed

1-5,7,12-15,20,21, as received on 16/10/2000 with letter of 16/10/2000
23-29,31,35,36,38-43,
44 (part),49-59

Drawings, sheets:

1/35-35/35 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP99/04855

- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
4. The amendments have resulted in the cancellation of:
- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:
5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*
- see separate sheet**
6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application.
- ☒ claims Nos. 2, 3, 4, 12, 13, 14.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☒ the claims, or said claims Nos. 2, 3, 4, 12, 13, 14 are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the said claims Nos. 2, 3, 4, 12, 13, 14.
2. A meaningful international preliminary examination report cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

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- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☒ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:
see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
- ☒ the parts relating to claims Nos. 1, 5, 7, 15, 21, 23-29, 31, 35, 36, 38-59.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1, 5, 7, 15, 20, 21, 23, 25-29, 35, 36, 38-43, 48, 51, 52, 54
	No:	Claims	24, 44-47, 49, 50, 53, 55-59
Inventive step (IS)	Yes:	Claims	20
	No:	Claims	1, 5, 7, 15, 21, 23-29, 31, 35, 36, 38-59
Industrial applicability (IA)	Yes:	Claims	1, 5, 7, 15, 20, 21, 23-29, 31, 35, 36, 38-59
	No:	Claims	none

2. Citations and explanations
see separate sheet

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VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

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R Item I

Basis of the report

1) The amendments filed on 16.10.2000 introduce subject-matter which extends beyond the content of the application as filed, contrary to **Article 34(2) b) PCT**:

1.1) In **claim 1**, the deletion of the features in lines 9-15 ("holding process ...", "applying to ... entire top surface", and of further essential features; cf. PCT International Preliminary Examination Guidelines VI, 7.13), as well as the added features of the "connecting step" (lines 12-15) have no basis in the application as filed.

1.2) The expression "in contact with the bonding agent" in **claim 5** has no basis in the application as filed.

1.3) The deletion of "for a same substrate" in **claim 7**: the information that the process is repeated on different substrates cannot be derived from the documents as filed (cf. PCT International Preliminary Examination Guidelines VI, 7.13.)

1.4) In **claim 21**, the deletion of the features in lines 7-13 of original claim 21 has no basis in the application as filed.

1.5) The expression "in a centre of each barrier rib top, when viewed widthwise" in **claim 24** has no basis in the application as filed.

1.6) In **claim 27**, the terms "bonding agent positioning member", "removing parts of" (instead of "forming holes in"), "grooves" (instead of "holes"), "attached ... at positions corresponding ..." have no basis in the application as filed.

In particular, "removing parts of" is a considerably broader term than "forming holes in", and thus contains information not present in the documents as filed.

1.7) The term "even connecting layer" in **claim 28** has no basis in the application as filed.

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1.8) The expressions "removes parts of" (instead of "forms holes in") and "bonding agent positioning member attached to ..." in **claim 29** have no basis in the application as filed.

1.9) The term "bonding agent positioning member" in **claim 35** has no basis in the application as filed.

1.10) In **claim 39**, the feature "positioned in a central area of ..., when viewed widthwise" has no basis in the application as filed.

1.11) The feature "connected via a bonding agent" in **claim 44** has no basis in the application as filed.

Further the following amendments to the description introduce subject-matter which extends beyond the content of the application as filed:

1.12) The inserted passage on page 5 line 7 to page 5a line 21.

1.13) The inserted passage on page 9 lines 18-21.

1.14) The passage "a flat substrate" on page 10 line 5. "Substrate" is a considerably broader term than "plate", and thus contains information not present in the documents as filed.

1.15) The passage "including ... formed" from page 11 line 22 to page 12 line 3.

1.16) The passage "are aligned ... simultaneously" on page 12 lines 5-6.

1.17) The passage "in a centre ... widthwise" on page 13 lines 23-24.

1.18) The term "the central area of ..." on page 14 line 2.

1.19) The term "bonding agent holding member" instead of "first member" on pages 15-16.

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1.20) The passage "removing parts of rib tops; ..." on page 15 lines 15-21, and the passage "removing parts of rib tops; ..." on page 16 lines 10-11.

1.21) The term "selectively" on page 18 line 18.

1.22) The passage "positioned in ... widthwise" on page 18 lines 19-20.

1.23) The term "central" on page 18 line 26 and on page 19 line 13.

1.24) The expression "via a bonding agent" on page 20 line 15.

2) This report is therefore established as if the above amendments had not been made, Rule 70.2 (c) PCT, and the examination is based on the version of claims 1, 5, 7, 21, 24, 27, 28, 29, 35, 39, and 44 as originally filed.

3) It is noted that lines 14 et seq. of claim 44 and claims 45-48 (on page 101) were not newly filed on 16.10.2000; and that claims 6, 8-11, 16-19, 22, 30, 32-34, and 37 were deleted.

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1) Claims 2, 3, and 4 are new independent claims. None of these claims is based on an originally filed independent claim, or on a combination of an independent claim with one or more claims dependent thereon as originally filed.

Thus, **claims 2, 3, and 4**, together with the claims **12, 13, and 14** which depend only on these claims, relate to inventions in respect of which no international search report has been established, and which are not subject of international preliminary examination according to Rule 66.1(e) PCT.

2) Moreover, although these claims appear to be related to the second, third, and seventh embodiment of the description, it is not clear on which passages of the

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description as filed the features of claims 2 (lines 9-19), 3 (lines 9-21), 4 (lines 9-18), and 13 ("flat substrate") are based (Art. 34(2)b) PCT).

Re Item IV

Lack of unity of invention

1) Reference is made to the following documents, cited in the International Search Report:

- D1: EP-A-0 814 491 (MOTOROLA INC) 29 December 1997 (1997-12-29)
- D2: WO 98 27571 A (AOKI MASAKI; MURAI RYUICHI (JP); SUZUKI SHIGEO (JP); YASUI HIDEAKI) 25 June 1998 (1998-06-25) &
- D2a: EP 0 945 886 A (MATSUSHITA ELECTRIC IND CO) 29 September 1999 (1999-09-29), which is used for the interpretation of D2 since it belongs to the same patent family
- D3: US-A-5 742 122 (TESHIROGI HITOSHI ET AL) 21 April 1998 (1998-04-21)

2) The application lacks unity within the meaning of Rule 13.1 PCT for the following reasons:

2.1) The common concept linking together the independent claims 1, 20, 21, 24, 27, 36, 39, 53, and 59 is the following (claims 1, 21, 24, 27, and 39 in the version as originally filed, see item I above):

A display panel, or a method of its manufacture, comprising

- a pair of substrates arranged in opposition and at least partially connected through a system of barrier ribs,
- a bonding agent applied to a plurality of barrier ribs on at least one of the substrates, wherein
- the pair of substrates is connected via the bonding agent.

This common concept is not novel, see documents **D1** (abstract, Fig. 7-17) and **D2** (Fig. 1-3 and 16; columns 12-14 and 28 of D2a)

Independent claim 44 as filed even shares only the first of the above features of this concept with the other independent claims.

2.2) The independent claims can be grouped according to their special technical features (STFs) as follows:

(1) Claims 1 as filed and claim 36; of which the STF is a bond holding member or bond sheet for transferring the bonding agent to parts of the barrier ribs, which solves the problem of equally applying a bonding agent to the upper surface of the barrier ribs;

(2) Claim 20, of which the STF is laminating a material and a bonding agent, and then removing laminated material in order to form a pattern of barrier ribs, which solves the problem of providing an alternative method of forming the barrier ribs.

(3) Claim 21 as filed, of which the STF is pressing a pattern-forming member onto a material in order to form a pattern of barrier ribs, and forming a bonding agent pattern using a pattern-forming member with the same pattern, which solves the problem of providing corresponding shapes of the upper surface of the barrier ribs and the bonding agent pattern.

(4) Claims 24 and 27 as filed, of which the STF is an indentation forming process for forming indentations or holes on top of the barrier ribs, and arranging the bonding agent in the indentations or holes, which solves the problem of providing an increased bond strength by increasing the bonding area.

(5) Claim 39 as filed, of which the STF is a hardening process for hardening parts of the bonding agent, and removing the parts of the bonding agent that have not been hardened, which solves the problem of avoiding contamination by the bonding agent outside a predetermined area.

(6) Claim 44 as filed, of which the STF is a plurality of pairs of electrodes covered with a dielectric layer on the first substrate and a plurality of barrier ribs on the second substrate, separated from and extending in a different direction than the

electrodes and the dielectric layer, and that the panel is structured such that the discharge mainly occurs in parts of the panel separated from the positions where the barrier ribs and the dielectric layer are connected, which solves the problem of effectively separating neighbouring discharges and hence avoid noise in the display.

(7) Claim 53, of which the STF is that a substance used for the bonding agent has a different melting or softening point than a substance used for the part of the substrate connected to the bonding agent, which solves the problem of avoiding deformation of the display panel when heated during bonding.

(8) Claim 59, of which the STF is that the bonding agent includes a substance which is more difficult to melt than the bonding agent, which solves the problem of reducing bleeding of the bonding agent during bonding.

There is no special technical feature in common to two or more of these groups.

The above groups equally do not share any corresponding technical features because each of the above special features produces a different technical effect and relates to the solution of a different technical problem. The above problems can be solved independently and do not form a linked series in which the solution of one problem depends on first solving the preceding problem. Thus they are technically independent.

Therefore the technical relationship between the subject-matter of the above (groups of) independent claims required by Rule 13.2 is lacking, and the requirement for unity of invention referred to in Rule 13.1 PCT is not fulfilled.

2.3) Hence the following separate inventions or groups of inventions are not so linked as to form a single general inventive concept:

(1) Claims 1, 5, and 7 as filed, claim 36 and 38, and, insofar they depend on claims 1 or 36, claims **15 and 43**:

A display panel manufacturing method, characterised in a bond holding member or bond sheet for transferring the bonding agent to parts of the barrier ribs;

(2) Claim 20, and, insofar it depends on claim 20, claim 43:

A display panel manufacturing method, characterised in laminating a material and a bonding agent, and then removing laminated material in order to form a pattern of barrier ribs;

(3) Claims 21 as filed and claim 23:

A display panel manufacturing method, characterised in pressing a pattern-forming member onto a material in order to form a pattern of barrier ribs, and forming a bonding agent pattern using the same pattern;

(4) Claim 24 as filed, claims 25-26, claims 27-29 as filed, claim 31, claim 35 as filed, and, insofar it depends on claims 24 or 27, claim 43:

A display panel manufacturing method, characterised in comprising an indentation forming process for forming indentations or holes on top of the barrier ribs, and arranging the bonding agent in the indentations or holes;

(5) Claim 39 as filed, claims 40-42, and, insofar it depends on claim 39, claim 43:

A display panel manufacturing method, characterised in comprising a hardening process for hardening parts of the bonding agent, and removing the parts of the bonding agent that have not been hardened;

(6) Claims 44-48 as filed and claims 49-52:

A gas discharge panel, characterised in a plurality of pairs of electrodes covered with a dielectric layer on the first substrate and a plurality of barrier ribs on the second substrate, separated from and extending in a different direction than the electrodes and the dielectric layer, and in that the panel is structured such that the discharge mainly occurs in parts of the panel separated from the positions where the barrier ribs and the dielectric layer are connected;

(7) Claims 53-58:

A display panel, characterised in that a substance used for the bonding agent has a different melting or softening point than a substance used for the part of the substrate connected to the bonding agent; and

(8) Claim 59:

A display panel, characterised in that the bonding agent includes a substance which is more difficult to melt than the bonding agent.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1) In addition to the documents cited in item IV above, reference is made to the following documents:

D4: EP-A-0 789 384 (SPECTRON CORP OF AMERICA LLC) 13 August 1997 (1997-08-13)

D5: EP-A-0 782 167 (PIONEER ELECTRONIC CORP) 2 July 1997 (1997-07-02)

D6: EP 0836892 A

D7: FR 2738393 A

D8: EP 0837486 A

D9: McGraw-Hill Concise Encyclopedia of Science & Technology (S. Parker, ed.); McGraw-Hill Book Company, New York 1984; page 1386.

2) The subject-matter of independent **claims 24 and 44 as filed** (see item I above) and **claims 53 and 59** is not new (**Article 33(2) PCT**):

2.1) The subject-matter of **claim 24 as filed** is not new over the disclosure of **D2** (see Fig. 16 and D2a paragraph 153 (column 28): bonding agent 15 is arranged in indentations formed on the top of the barrier ribs 7).

(It is noted that in D2 Fig. 16, there are ridges on both side of the indentations. This feature will necessarily prevent the bonding agent from seeping into the discharge spaces.)

2.2) The subject-matter of **claim 44 as filed** is not new over the disclosure of **D5** (see

abstract, column 7 line 25 to column 8 line 38; Fig. 1, 6, 9, 11, 13, and 16; column 17 line 50 to column 21 line 53):

In the sustaining discharge mode, the discharge spreads over the electrode pairs Xi, Yi (see e.g. column 19 lines 35-39, column 18 lines 32-35, Fig. 6), whereas the reset discharge is even more restricted. Since most part of these electrodes is at a distance from the barrier ribs 126 in Fig. 9, 11, 13 and 16, the discharge (both reset and sustaining) mainly occurs in parts of the panel which are separated from the positions where the barrier ribs 126 and the dielectric layer 132 are connected by mechanical contact (once front and back surface of the panel are bonded together, and because of the subatmospheric filling pressure of 400-600 Torr, the ribs and the dielectric layer necessarily contact each other).

2.3) For essentially the same reasons, the subject-matter of **claim 44 as filed** is equally not new over the disclosure of **D3** (see abstract, Fig. 1 to 4; column 4 line 46 to column 6 line 26: the discharge mainly occurs in a region G, Fig. 3 and column 4 line 63; the ribs 31 and the dielectric layer 24 are in contact, column 6 line 18).

2.4) The subject-matter of **claim 53** is not new over the disclosure of **D2** (see Fig. 6 and D2a paragraphs 91, 92; Fig. 13 and paragraph 139 as well as Fig. 17 and paragraph 165: 450°C, or the melting point of lead oxide or frit glass, is lower than the melting point of division walls 7 (see also paragraphs 37 and 174: alumina)).

2.5) The subject-matter of **claim 53** is equally not new over the disclosure of **D1** (see abstract, column 4 lines 26-55, and figures).

2.6) The subject-matter of **claim 59** is not new over the disclosure of **D2** (see D2a paragraph 139: ceramics is more difficult to melt than lead oxide).

3) The subject-matter of independent **claims 1, 21, 27, and 39 as filed** (see item I above), **and of claim 36** does not involve an inventive step (**Article 33(3) PCT**):

3.1) Document **D2** (see abstract, Fig. 1, 6; paragraphs 34-42, 104, 156-157) discloses a display panel manufacturing process, comprising the connection process of present

claim 1, and applying a bonding agent to almost an entire top surface of each barrier rib by screen printing (D2a paragraphs 104 and 157) .

It belongs, however, to general knowledge (see D9 page 1386) that in screen printing a holding member (printing frame) holds a paste to be printed to form an application surface for the paste which is brought into contact with the surface to be printed on, while the degree of contact of the paste with the latter surface is regulated by a squeegee.

Thus the skilled person arrives at the subject matter of **claim 1 as filed** by applying standard knowledge, without involving an inventive step.

3.2) Document **D2** also discloses arranging the bonding agent on the barrier ribs by lift-off (paragraphs 104, 156).

In the context of the screen printing method which is explained in detail in D2, and to which lift-off is an alternative, it is clear that the bonding agent itself (and not a photoresist) is to be applied by lift-off.

Arranging the bonding agent into contact with and transferring it to the barrier ribs are necessary and implicit features of the lift-off technique (otherwise the bonding agent could not be applied).

It is a trivial and routine design to perform the lift-off of the bonding agent from a sheet. Thus the skilled person arrives at the subject-matter of **claim 36** without involving an inventive activity.

3.3) Document **D2** discloses the subject-matter of **claim 21 as filed** except for the feature that the barrier rib pattern is formed by pressing. (See in particular D2a paragraph 157, which teaches that the bonding agent is applied (by a not specified means or member) which has the same pattern as the barrier ribs. Claim 21 does not restrict in any way the pattern forming member).

Forming the barrier ribs of a display panel by pressing is however a well-known process (see **D6** page 12 line 17, **D7** abstract, **D8** abstract), which is functionally unrelated to

the bonding process. The subject-matter of claim 21 as filed thus amounts to a mere juxtaposition of known features which is not based on an inventive activity (cf. PCT International Preliminary Examination Guidelines IV-8.3a).

3.4) The subject-matter of **claim 27 as filed** does not involve an inventive step over the disclosure of **D2**, for essentially the same reasons as given in conjunction with claim 1 above:

In screen printing, holes are formed in a first member (printing stencil) by a first removing process in order to provide the printing pattern. During printing, the member is attached to the surface which is printed on and the printing paste fills the holes, and after printing the remaining (i.e. patterned with holes) member is removed.

The subject matter of claim 27 as filed is thus arrived at when following the teaching of D2 to apply the bonding agent by screen printing, without involving an inventive step.

3.5) The subject-matter of **claim 39 as filed** does not involve an inventive step over the disclosure of **D2**, see in particular D2a paragraph 92 which teaches to apply an UV adhesive (UV-hardenable bonding agent) to selected regions of the ribs.

It is, however, routine photolithography practice to first coat an entire surface, harden selected regions of the surface by UV, and to remove the parts which were not hardened. The skilled person would routinely apply this standard practice when following the teaching of D2, thereby arriving at the subject-matter of claim 39 as filed in an obvious manner.

3.6) Even if delimited against D3 or D5 by specifying that the barrier ribs are bonded to the dielectric layer, the subject-matter of **claim 44** would not involve an inventive step since it is obvious to apply the teaching of D2 (to bond these parts together) to the display panels of D3 or D5 (as cited above, 2.2-3), thereby arriving at the subject-matter of this claim.

D2 (see D2a paragraphs 21-27) provides a clear indication to do so. The specific indication need not be the same as in the present application as long as there is one.

4) Dependent **claims 5 and 7 as filed, 15, 23, 25, 26, 28 and 29 as filed, 31, 35 as filed, 38, 40-43, 45-48 as filed, 49-52, and 54-58** only comprise subject-matter relating

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to features which are either known, explicitly or implicitly, from the citations or considered to be routine matter to be expected of the skilled person. Therefore these claims, too, do not meet the requirements of the PCT with respect to novelty and inventive step (**Articles 33(2) and (3) PCT**).

The subject-matter of claims 45-47, 49, 50, and 55-58 is even not new over the prior art documents cited with respect to the claims these claims depend on (i.e. D3 or D5; D2).

The unclear features in claim 23 (see item VIII below) cannot be used to distinguish the invention from the prior art (cf. PCT International Preliminary Examination Guidelines III-4.5a).

5) The subject-matter of claim 20 meets the requirements of the PCT with respect to novelty and inventive step (Articles 33(2) and (3) PCT):

The subject-matter of claim 20 differs from the prior art (e.g. D2) in laminating a material and a bonding agent, and then removing laminated material in order to form a pattern of barrier ribs, which solves the technical problem of providing an alternative method of forming the barrier ribs and of assuring coincidence between the patterns of the barrier ribs and the bonding agent.

This is not rendered obvious by a prior art document:

Although D6 and D7 teach laminating a mixture of bonding agent and glass frit as a material for barrier ribs, and then transferring pre-formed ribs onto the back face of a display panel, they do not teach patterning of a distinct bonding agent layer on the barrier ribs.

Re Item VII

Certain defects in the international application

1) The independent claims are not formulated in the two-part form, such that features known in combination from the prior art are placed in the preamble of these claims in accordance with (Rule 6.3(b)(i-ii) PCT).

2) The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3) The relevant background art disclosed in the documents **D1, D2, D3, D6, and D7** is not mentioned in the description, nor are these documents identified therein (Rule 5.1(a)(ii) PCT).

Re Item VIII

Certain observations on the international application

1) Lack of clarity (Art. 6 PCT)

In **claim 23** the expression "the pattern forming member used in claim 21" is unclear since

- the use (in claim 21) of a pattern forming member does not characterise the member itself; and
- in claim 21 as filed there are two pattern forming members; it is unclear which is meant.

Although claim 23 appears to be intended as dependent on claim 21, this is not clearly indicated (Art. 6 PCT) by only referring to a single feature of claim 21.

2) Lack of conciseness (Art. 6 PCT)

2.1) Although **claims 1 as filed and 36** have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. (a bonding agent formed on a bond holding member, for applying the bonding agent to the barrier ribs, is an already formed bond sheet for doing the same)

These claims therefore lack conciseness and do not meet the requirements of Article 6

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PCT.

2.2) For the same reasons, independent **claims 24 and 27 as filed** lack conciseness and do not meet the requirements of Article 6 PCT (a hole is an indentation; also a groove is an indentation).

2.3) Claim 58 is a duplicate of claim 57 and therefore not concise.

demarcated by the barrier ribs 2103. Cells are formed in the discharge spaces 2200 at the points where discharge electrodes 2002 and address electrodes 2102 intersect. Fig. 42 shows only one such cell, but in fact the PDP normally includes a plurality of cells in which the phosphor layer 2104 is composed of alternating red, green and blue phosphors, enabling a color display to be produced. Note that in the drawing, the discharge electrodes 2002 and the address electrodes 2102 are drawn as if arranged in parallel, but in fact they are arranged at right angles.

A discharge gas, such as a mixture of neon and xenon, is normally enclosed into the discharge spaces 2200 at a pressure of around 500 Torr (6.65×10^4 Pa).

In practice, however, such conventional PDPs have not always been able to achieve satisfactory luminance. In order to improve luminance, it is considered necessary to enclose the discharge gas inside the discharge spaces 2200 at an internal pressure exceeding 500 Torr (6.65×10^4 Pa).

However, when the internal pressure in the discharge spaces 2200 is raised to 760 Torr (1.01×10^5 Pa) or 1000 Torr (1.33×10^5 Pa), for example, gaps are generated between the barrier ribs 2103 formed on the back glass plate 2101 and the front substrate 2000, while the front and back substrates 2000 and 2100 bulge outwards. This means that neighboring discharge spaces 2200 are no longer effectively divided by the barrier ribs 2103, causing the display performance of the PDP to deteriorate.

Even if the internal pressure is set at 760 Torr (1.01×10^5 Pa) or less, the barrier ribs 2103 are not connected to the front substrate 2100, so that external vibrations or vibrations caused by driving the PDP itself bring the barrier ribs 2103 and the front substrate 2000 repeatedly into contact, generating noise.

In order to correct these problems, one related technique has proposed that the topmost edge of the barrier ribs 2103 be coated with a bonding agent before fixing the pair of substrates together to form the discharge spaces 2200. A gas discharge panel in which gas has been sealed at a higher pressure is produced, realizing an improvement in luminance. Such a procedure is described in Japanese Patent Application No. 9-49006.

However, when a well-known method such as screen-printing is used to apply the bonding agent to the topmost edge of the barrier ribs 2103, it is difficult to apply the bonding agent equally to the very long and narrow top surfaces of the barrier ribs 2103 without leaving some parts uncovered. In the case of screen-printing, matching an aperture pattern accurately to the shape of the barrier ribs 2103 has proved extremely difficult. As a result, finding a simple method for improving bonding strength, while maintaining display performance and preventing the generation of distortion when the barrier ribs 2103 touch the front substrate 2000 has posed considerable obstacles.

Furthermore, the properties of the dielectric glass layer

2003 covering the electrodes change if exposed to the
discharge

manufacturing method, comprising an application process for applying a bonding agent to a plurality of barrier ribs formed on at least one of a pair of substrates, and a connection process for arranging the pair of substrates in opposition and connecting the pair of substrates together via the bonding agent that has been applied to the barrier ribs is provided. The application process includes a bonding agent layer forming step for forming a layer of a paste-like bonding agent having an even surface over a substrate having an even surface; and a connecting step for simultaneously bringing a top of each barrier rib down into contact with the bonding agent layer, while regulating a distance between the upper surface of the bonding agent layer and the barrier ribs.

A display panel manufacturing method may further include an application process for applying a bonding agent to a plurality of barrier ribs formed on at least one of a pair of substrates, and a connection process for arranging the pair of substrates in opposition and connecting the pair of substrates together via the bonding agent that has been applied to the barrier ribs. The application process includes a bonding agent layer forming step for forming a layer of a paste-like bonding agent having an even surface so as to embed a position regulating member that regulates positions of the barrier ribs within the layer, the position regulating member being arranged on a substrate having an even surface; and a connecting step for bringing a top of each barrier rib down into contact with the position regulating member

to apply the bonding agent simultaneously to the tops of all of the barrier ribs while regulating a distance between the upper surface of the bonding agent layer and the barrier ribs.

Furthermore, a display panel manufacturing method may include an

5 application process for applying a bonding agent to a plurality of barrier ribs formed on at least one of a pair of substrates, and a connection process for arranging the pair of substrates in opposition and connecting the pair of substrates together via the bonding agent that has been applied to the barrier ribs. The

10 application process includes a bonding agent layer forming step for forming a layer of a paste-like bonding agent having a curved surface so as to embed a position regulating member that regulates positions of the barrier ribs within the layer, the position regulating member being arranged on a substrate having

15 a curved surface; and a connecting step for bringing a part of each barrier rib top down into contact with the position regulating member, and then to move the position regulating member along a length of the barrier ribs to apply the bonding agent to the tops of all of the barrier ribs while regulating a distance between the upper surface of the bonding agent layer and the barrier ribs.

In this way, the invention aligns barrier rib tops and the bonding agent arranged on the barrier rib tops using surface tension created on the surface of the barrier ribs by bringing 25 the barrier rib tops and the surface of a bonding paste layer into the appropriate degree of contact. This method is used

rather than a screen plate with an aperture pattern like that used in screen-printing. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy lines.

This means that, if a screen-printing method is used when the barrier ribs are arranged in a stripe formation, aligning the

bonding agent 2300 is formed so that the bonding agent 2300 is more thickly applied near the center of the barrier rib top as seen in cross-section, and becomes thinner towards the edges. When the barrier ribs 2103 are connected to the front panel, the bonding agent 2300 oozes out from either side of each barrier rib 2103, as shown by the protruding parts 2301 in the drawing. Such protruding parts 2301 reduce the light-emitting area as seen from the front glass plate by a corresponding amount, causing luminance to deteriorate. Accordingly, the protruding parts 2301 need to be made as small as possible to limit deterioration in luminance. Thus it is preferable for the shape of the bonding agent 2300 before the barrier ribs are connected to be formed so that a thinner coating runs along both sides of the top of each barrier rib 2103.

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Here, the relative positions of the barrier ribs and the bonding agent can be altered while keeping the barrier ribs in contact with the bonding agent layer. This enables the bonding agent to be applied more evenly to the barrier rib tops.

The bonding agent applying process should preferably be repeated a plurality of times.

The position regulating member may be made from wire rods, which are either interwoven or lined up precisely. The position regulating member may also be composed of indentations and protrusions formed on the surface of a flat substrate, or may be a plurality of half-cylinders, the barrier rib tops being brought into contact with the curved surface of the half-cylinders.

If the bonding agent is applied after implementation of a process for leveling the barrier ribs across the entire surface of the substrate so that all the barrier rib tops are at approximately the same height, variations in the amount of bonding agent applied, caused by variations in the height of different barrier ribs or along the length of one barrier rib, are eliminated. This allows the bonding agent to be evenly applied to the barrier rib tops without any irregularities.

In order to achieve the first object, a display panel manufacturing method, for connecting a pair of substrates arranged in opposition via a plurality of barrier ribs formed in a specific pattern on at least one of the substrates and a bonding agent arranged on the barrier ribs is provided. The display panel manufacturing method includes a barrier rib pattern forming process and a bonding agent pattern forming process. These processes include a first step for laminating the bonding agent and a material for forming the barrier ribs by forming layers of certain thicknesses; a second step for simultaneously removing corresponding parts of the laminated barrier rib

material and bonding agent to form the specific pattern; and a third step for transferring the pattern formed in the barrier rib forming material and bonding agent to the substrate on which the barrier ribs are to be formed.

5 Here, the barrier rib tops and the bonding agent arranged on the barrier rib tops are aligned by removing corresponding parts of the barrier rib and bonding agent layers at the same time. The pattern for the barrier ribs and the bonding agent can thus be formed simultaneously. This method is used rather than a
10 screen plate with an aperture pattern like that used in screen-printing. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy lines. This produces a display panel with greater bonding
15 strength.

Also in order to achieve the above first object, a display panel manufacturing method, for connecting a pair of substrates arranged in opposition, via a bonding agent, which has been applied to a plurality of barrier ribs formed in a specific
20 pattern on at least one of the substrates is provided. The display panel manufacturing method includes a barrier rib pattern forming process including a first step for laminating the barrier rib forming material and the bonding agent by forming layers of certain thicknesses; a second step for simultaneously pressing
25 down the laminated barrier rib forming material and bonding agent using a same pattern-forming member to form the specific pattern;

and a third step for transferring a molded pattern formed in the barrier rib forming material and bonding agent to the substrate on which the barrier ribs are to be formed.

Here, the barrier rib tops and the bonding agent arranged on the barrier tops are aligned by forming the pattern for the barrier ribs and the bonding agent simultaneously. This method is used rather than a screen plate with an aperture pattern like that used in screen-printing. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy lines. This produces a display panel with greater bonding strength.

Here, at least one indentation and protrusion is formed on the parts of the pattern-forming member that correspond to top surfaces of the barrier ribs on which the bonding agent is applied.

Here, the alignment of the barrier ribs and the bonding agent is determined by indentations and protrusions, allowing the bonding agent to be arranged more accurately on the barrier rib tops. This produces a display panel with greater bonding strength.

Also, in order to achieve the above first object, a display panel manufacturing method, for connecting a pair of substrates arranged in opposition via a bonding agent arranged on a plurality of barrier ribs formed in a specific pattern on at least one of the substrates is provided. The display panel manufacturing method includes an indentation forming process for forming at least one indentation in a centre of each barrier rib top, when viewed widthwise; and a bonding agent arranging process for arranging the bonding agent in the indentations.

The barrier rib tops and the bonding agent arranged on the

barrier rib tops are here aligned by indentations formed in advance in the central area of the barrier rib tops. This method is used rather than a screen plate with an aperture pattern like that used in screen-printing. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy lines.

When the bonding agent is arranged on barrier rib tops without indentations, the bonding agent tends to seep off the barrier rib tops. This is another reason why the bonding agent cannot be arranged evenly on the barrier rib tops. Since the bonding agent in the present invention is arranged in the indentations formed in the barrier rib tops, this kind of run-off is prevented, enabling the bonding agent to be applied evenly to the barrier rib tops. As a result, a display panel having greater bonding strength can be obtained.

Additionally, arranging the bonding agent in the indentations prevents the bonding agent from trickling down from the barrier rib tops into the front glass plate side of the panel when firing is performed.

The barrier rib pattern is formed by pressing a pattern-forming member onto the barrier rib forming material, the barrier rib forming material being arranged in a layer of a specific thickness, and the indentation forming process is performed simultaneously with the barrier rib pattern formation when the pattern-forming member is pressed onto the barrier rib forming

material.

Here, the bonding agent may be arranged in the indentations using a screen-printing method, or by a method in which the bonding agent is injected into the indentations via a nozzle.

5 Of the several possible methods, the nozzle-injection method is preferred since this method applies the bonding agent to the indentations most accurately.

10 In order to achieve the first object, a display panel manufacturing method, for connecting a pair of substrates arranged in opposition via a bonding agent arranged on a plurality of barrier ribs formed in a specific pattern on at least one of the substrates is provided. A process for arranging the bonding agent on the barrier ribs includes an attaching process for attaching a bonding agent positioning member to the barrier ribs; a first removing process for removing parts of the bonding agent positioning member attached to the barrier rib tops at positions corresponding to the specific pattern, to form a groove along each barrier rib top; a bonding agent filling process for filling the grooves with the bonding agent, while maintaining the relative positions of the grooves and the barrier rib tops; and a second removing process for removing the remaining bonding agent positioning member.

20 Here the barrier rib tops and the bonding agent arranged on the barrier rib tops are aligned based on a pattern formed so that it conforms to the barrier rib pattern. This method is used rather than a screen plate with an aperture pattern like that

used in conventional screen-printing techniques. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops

are not strictly linear, and form wavy lines. This enables a display panel with greater bonding strength to be obtained. Furthermore, the bonding agent is prevented from flowing off the barrier rib tops by the bonding agent positioning member, until
5 the bonding agent positioning member is removed.

The adhesion process is performed by applying the bonding agent positioning member to the barrier ribs after a connecting layer is formed on either the barrier ribs or the bonding agent positioning member.

10 The first removing process removes parts of the bonding agent positioning member attached to the barrier rib tops by irradiating the surface of the bonding agent positioning member with a laser.

15 Here, it is preferable that a material used for the barrier rib tops absorbs laser light more easily than a material used for other parts of the barrier ribs.

The first removing process may form holes in the first member
20 adhering to the barrier rib tops using a grinding method.

Here, if the central area of each barrier rib top is removed in the first removing process, the amount of bonding agent that seeps into the cell area after the panel has been sealed is further reduced.

25

Here, in the bond agent filling process, the bond agent may be applied using a screen-printing method or a nozzle-injection method.

5 The second removing process removes the remainder of the first member using peeling, melting and sublimation.

The above first object may also be achieved by a display panel manufacturing method, for connecting a pair of substrates arranged in opposition via a bonding agent applied to a plurality of barrier ribs formed on at least one of the substrates. A
10 process for arranging the bonding agent on the barrier ribs includes an arranging process for bringing an already formed bond sheet into contact with tops of the barrier ribs; a transfer process for transferring the bonding agent to the parts of the barrier rib in contact with the bond sheet by pressing the bond
15 sheet onto the barrier rib tops; and a removing process for separating the bond sheet from the barrier ribs.

Here, the bonding agent in the present invention is arranged on the barrier rib tops with the bonding agent and the barrier rib tops in an accurately aligned state by bringing a bond sheet
20 and the barrier rib tops into contact and transferring the bonding agent selectively to those parts of the barrier rib tops touching the bond sheet. This method is used rather than a screen plate with an aperture pattern like that used in screen-printing. As a result, the bonding agent can be applied evenly
25 along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy

lines. This enables a display panel with greater bonding strength to be obtained.

5

The transfer process should preferably heat the parts of the bond sheet in contact with the barrier rib tops.

10

This gives the bonding agent greater adhesiveness, enabling it to be transferred to the barrier rib tops with more reliability.

15

The above first object may also be achieved by a display panel manufacturing method, for connecting a pair of substrates arranged in opposition via a plurality of barrier ribs formed on at least one of the substrates, and a bonding agent applied to the barrier ribs. The display panel manufacturing method includes an applying process for applying the bonding agent to an area on each barrier rib that is at least as large as a top of each barrier rib; a hardening process for selectively hardening parts of the attached bonding agent positioned in a central area of the barrier rib tops, when viewed widthwise; and a removing process for removing the parts of the bonding agent that have not been hardened.

20

25

Here, the application area for the bonding agent is not established from the outset as in screen-printing. Instead, the bonding agent is arranged on the barrier rib tops, covering an area than is wider than the barrier rib tops. Central parts of

the arranged bonding agent are then hardened and the parts that still remain soft are selectively removed, leaving the bonding agent

arranged appropriately along the barrier rib tops. As a result, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, enabling a display panel with greater bonding strength to be obtained. If the accuracy with which parts of the bonding agent are hardened can be improved, the bonding agent can be applied evenly along the narrow barrier rib tops using a simple technique, even if the barrier rib tops are not strictly linear, and form wavy lines. This enables a display panel with even greater bonding strength to be obtained.

In the applying process, a compound of bonding agent and photo-hardening resin is applied to the barrier rib tops; and in the hardening process, central parts of the applied compound are exposed to light, causing the exposed parts of the compound to harden.

A resin that hardens upon exposure to ultra-violet light is used as the photo-hardening resin, and the light used in the hardening process may be ultra-violet light.

In the hardening process, after ultra-violet irradiation has taken place, hardened parts of the bonding agent are heated.

This enables the hardened bonding agent to be more firmly hardened.

The bonding agent is arranged on the barrier ribs using a compound including a substance which is more difficult to melt than the bonding agent.

The substance supports the load of the front substrate,

preventing bonding agent melted when the substrates are sealed from being pressed down by the weight of the front substrate and seeping into the cell area. This stops the panel from being fired with bonding agent seepage inside the cell area.

5 Next, to achieve the above second object, the present invention also includes a gas discharge panel, including a first substrate, on which a plurality of pairs of electrodes extending in a first direction, and a dielectric layer covering the electrodes have been formed, and a second substrate, on which a
10 plurality of barrier ribs, extending in a second direction differing from the first direction, are formed in opposition to the dielectric layer and the electrode pairs so that the barrier ribs are separated from the dielectric layer and the electrode pairs. Here the dielectric layer and the barrier ribs are at
15 least partially connected via a bonding agent. The panel is structured such that discharge mainly occurs in parts of the panel separated from the positions where the barrier ribs and the dielectric layer are connected.

20 This means that discharge does not occur equally throughout each cell, but is more likely to occur in the parts of a cell distanced from the locations where the barrier ribs are connected than in those parts near to the connected areas. Accordingly, the bonding agent applied to the barrier rib tops is less likely to be exposed to discharge, preventing pigments, residual carbon,
25 and the like from contaminating the discharge gas in the discharge spaces. As a result, increases in discharge voltage,

structure in which parts of the barrier ribs which do not correspond to cells are attached to the front substrate. Another option is a panel structure in which the barrier ribs are partially connected to the first substrate with a bonding agent, which is applied to the barrier rib tops so that the area covered is narrower than each barrier rib top.

The term 'barrier rib tops' in the last panel structure described above refers to a flat area on the top of each barrier rib, if the barrier ribs have a level upper surface. Alternately, if the tops of the barrier ribs have a curved surface, the term refers to an area determined by a value that is approximately double the size of the radius of the curved surface.

Gas should preferably be enclosed in the space between the first and second substrates of the gas discharge panel at a pressure of not less than 760 Torr (1.01×10^5 Pa).

Brief Description of the Drawings

Fig. 1 is a cross-sectional diagram showing an outline of an AC surface discharge PDP relating to the first embodiment;

Fig. 2 shows an outline of the structure of an ink applying device used when forming the phosphor layer;

Fig. 3 shows a method for arranging the bonding agent on the tops of the barrier ribs;

Fig. 4 shows a situation in which the barrier ribs are of different heights;

tops of the barrier ribs 18 coated with a bonding agent onto the surface of the protective layer 14 on the front substrate PA1 and firing the PDP. The PDP is completed by enclosing a discharge gas (a mixture of inert gases with, for example, a He-Xe or Ne-Xe base) inside the discharge spaces 20 defined by the barrier ribs 18.

In the present embodiment, the pressure of the enclosed inert gas is set at a high level of at least 760 Torr (1.01×10^5 Pa), and at least as great as atmospheric pressure.

The reason for using this kind of high pressure is that the shape of the discharge is likely to be altered, enabling a linear glow discharge or a two-phase glow discharge to be more easily produced, rather than simply producing a conventional one-phase glow discharge. This increases electron density in the positive column of the discharge, allowing energy to be supplied in a concentrated fashion. Resulting increases in ultra-violet light emissions and the like improve luminous efficiency and allow high luminance levels to be obtained. A more detailed description of this process can be found in Japanese Patent Application No. 10-229640.

The following is a description of the main point of this invention: a method for fixing the front substrate PA1 and the back substrate PA2 together, and in particular a method for applying a bonding agent for fixing the barrier ribs 18 and the protective layer 14 to the barrier ribs 18 in order.

agent 709 is applied, it is vital to ensure that the resinous film 701 remains in the same location relative to the back substrate PA2.

Following this, in stage (4), bonding agent 709 adhering to the surface of the resinous film 701 is removed using a tape polishing method. Then, the remaining resinous film 701 is removed using a method such as peeling off the film, melting or sublimation by a laser beam. Thus, a layer of bonding agent 709 can be formed evenly along the tops of the barrier ribs 18.

Fifteenth Embodiment

This embodiment is characterized by a method for arranging the bonding agent on the tops of the barrier ribs, so the following explanation concentrates on this method.

Fig. 27 is a process diagram showing the method for arranging the bonding agent in the present embodiment. The processing sequence is performed in the order of the stages (1) to (4). As shown in these drawings, the bonding agent in the present embodiment is arranged on the barrier ribs using the film transfer method described below.

First, in stage (1), a back substrate PA2, formed by arranging the visible light-reflecting layer 17 and barrier ribs 18 on a back glass plate 15, is prepared (the phosphor layer 19

pressure rollers 1002. The back panel PA2 and the pressure rollers 1002 should also be heated during the fixing process in order to improve cohesiveness.

5 The embodiments thus far have described methods of arranging the bonding agent. At this point therefore it would seem appropriate to give a brief indication of the degree of bonding strength possessed by a PDP manufactured using the methods described in the first to seventeenth embodiments.

10 The inside of a PDP manufactured based on the above embodiments was pressurized by the introduction of air, and the bonding strength determined by the pressure value obtained at the time the panel exploded. The resulting value was found to be 6100 Torr (8.11×10^5 Pa).

15 Eighteenth Embodiment

This embodiment is characterized by the bonding agent itself, so the following explanation concentrates on the composition of the bonding agent.

20 In the present embodiment, the bonding agent applied to the tops of the barrier ribs is a mixture including beads having a higher melting point than that of the glass substance used to fix the barrier ribs and the protective layer together. Attachment is performed at a temperature between the melting points of the beads and the glass substance, so that the latter melts, but the
25 former does not. The following effects are achieved by performing attachment at this temperature using such a bonding

CLAIMS

1 1. (Amended) A display panel manufacturing method,
2 comprising an application process for applying a bonding agent
3 to a plurality of barrier ribs formed on at least one of a
4 pair of substrates, and a connection process for arranging the
5 pair of substrates in opposition and connecting the pair of
6 substrates together via the bonding agent that has been
7 applied to the barrier ribs, wherein the application process
8 includes:

9 a bonding agent layer forming step for forming a layer
10 of a paste-like bonding agent having an even surface over a
11 substrate having an even surface; and

12 a connecting step for simultaneously bringing a top of
13 each barrier rib down into contact with the bonding agent
14 layer, while regulating a distance between the upper surface
15 of the bonding agent layer and the barrier ribs.

1 2. (Amended) A display panel manufacturing method,
2 comprising an application process for applying a bonding agent
3 to a plurality of barrier ribs formed on at least one of a
4 pair of substrates, and a connection process for arranging the
5 pair of substrates in opposition and connecting the pair of
6 substrates together via the bonding agent that has been
7 applied to the barrier ribs, wherein the application process
8 includes:

9 a bonding agent layer forming step for forming a layer
10 of a paste-like bonding agent having an even surface so as to
11 embed a position regulating member that regulates positions of
12 the barrier ribs within the layer, the position regulating
13 member being arranged on a substrate having an even surface;
14 and

15 a connecting step for bringing a top of each barrier rib
16 down into contact with the position regulating member to apply
17 the bonding agent simultaneously to the tops of all of the
18 barrier ribs while regulating a distance between the upper
19 surface of the bonding agent layer and the barrier ribs.

1 3. (Amended) A display panel manufacturing method,
2 comprising an application process for applying a bonding agent
3 to a plurality of barrier ribs formed on at least one of a
4 pair of substrates, and a connection process for arranging the
5 pair of substrates in opposition and connecting the pair of
6 substrates together via the bonding agent that has been
7 applied to the barrier ribs, wherein the application process
8 includes:

9 a bonding agent layer forming step for forming a layer
10 of a paste-like bonding agent having a curved surface so as to
11 embed a position regulating member that regulates positions of
12 the barrier ribs within the layer, the position regulating
13 member being arranged on a substrate having a curved surface;
14 and

15 a connecting step for bringing a part of each barrier
16 rib top down into contact with the position regulating member,
17 and then to move the position regulating member along a length
18 of the barrier ribs to apply the bonding agent to the tops of
19 all of the barrier ribs while regulating a distance between
20 the upper surface of the bonding agent layer and the barrier
21 ribs.

1 4. (Amended) A display panel manufacturing method,
2 comprising an application process for applying a bonding agent
3 to a plurality of barrier ribs formed on at least one of a
4 pair of substrates, and a connection process for arranging the

5 pair of substrates in opposition and connecting the pair of
6 substrates together via the bonding agent that has been
7 applied to the barrier ribs, wherein the application process
8 includes:

9 a bonding agent layer forming step for forming a layer
10 of a paste-like bonding agent having an even surface over a
11 substrate having an even surface; and

12 a connecting step for momentarily bringing one part of
13 each barrier rib top into contact with the bonding agent
14 layer, and then altering the relative positions of the barrier
15 ribs and the bonding agent layer while maintaining a distance
16 between the barrier ribs and the bonding agent layer such that
17 the bonding agent is applied to all the barrier rib tops as a
18 result of surface tension.

1 5. (Amended) The display panel manufacturing method of
2 one of Claims 1 and 2, wherein the relative positions of the
3 bonding agent and the barrier ribs are altered with the
4 barrier rib tops in contact with the bonding agent.

1 6. Canceled.

1 7. (Amended) The display panel manufacturing method of
2 any one of Claims 1 to 4, wherein the bonding agent applying
3 process is repeated a plurality of times.

1 8. Canceled.

1 9. Canceled.

1 10. Canceled.

1 11. Canceled.

1 12. (Amended) The display panel manufacturing method of
2 one of Claims 2 and 3, wherein the regulating means is formed
3 from interwoven wire rods.

1 13. (Amended) The display panel manufacturing method of
2 one of Claims 2 and 3, wherein the regulating means is
3 indentations and protrusions formed on a surface of a flat
4 substrate.

1 14. (Amended) The display panel manufacturing method of
2 one of Claims 2 and 3, wherein the position regulating member
3 is a plurality of half-cylinders, and the barrier rib tops are
4 brought into contact with the

5 curved surface of the half-cylinders.

1 15. (Amended) The display panel manufacturing method of
2 any one of Claims 1 to 4 further including a process for
3 leveling the barrier ribs across almost the entire surface of
4 the substrate so that all the barrier rib tops are at
5 approximately the same height.

1 16. Canceled.

1 17. Canceled.

1 18. Canceled.

1 19. Canceled.

1 20. A display panel manufacturing method, for
2 connecting a pair of substrates arranged in opposition via (1)
3 a plurality of barrier ribs formed in a specific pattern on at
4 least one of the substrates and (2) a bonding agent arranged
5 on the barrier ribs, the display panel manufacturing method
6 comprising a barrier rib pattern forming process and a bonding
7 agent pattern forming process, including:

8 a first step for laminating the bonding agent and a
9 material for forming the barrier ribs by forming layers of
10 certain thicknesses;

11 a second step for simultaneously removing corresponding
12 parts of the laminated barrier rib material and bonding agent
13 to form the specific pattern; and

14 a third step for transferring the pattern formed in the
15 barrier rib forming material and bonding agent to the
16 substrate on which the barrier ribs are to be formed.

1 21. (Amended) A display panel manufacturing method, for
2 connecting a pair of substrates arranged in opposition, via a
3 bonding agent, which has been applied to a plurality of
4 barrier ribs formed in a specific pattern on at least one of
5 the substrates, the display panel manufacturing method
6 comprising a barrier rib pattern forming process that
7 includes:

8 a first step for laminating the barrier rib forming
9 material and the bonding agent by forming layers of certain
10 thicknesses;

11 a second step for simultaneously pressing down the
12 laminated barrier rib forming material and bonding agent using
13 a same pattern-forming member to form the specific pattern;
14 and

15 a third step for transferring a molded pattern formed in
16 the barrier rib forming material and bonding agent to the
17 substrate on which the barrier ribs are to be formed.

1 22. Canceled.

1 23. A display panel manufacturing method, wherein at
2 least one indentation and protrusion is formed on the parts of
3 the pattern-forming member used in Claim 21 that correspond to
4 top surfaces of the barrier ribs on which the bonding agent is
5 applied.

1 24. (Amended) A display panel manufacturing method, for
2 connecting a pair of substrates arranged in opposition via a
3 bonding agent arranged on a plurality of barrier ribs formed
4 in a specific pattern on at least one of the substrates, the
5 display panel manufacturing method comprising:

6 an indentation forming process for forming at least one
7 indentation in a centre of each barrier rib top, when viewed
8 widthwise; and

9 a bonding agent arranging process for arranging the
10 bonding agent in the indentations.

1 25. The display panel manufacturing method of Claim 24,
2 the barrier rib pattern being formed by pressing a pattern-
3 forming member onto the barrier rib forming material, the
4 barrier rib forming material being arranged in a layer of a
5 specific thickness, and

6 the indentation forming process is performed
7 simultaneously with the barrier rib pattern formation when the
8 pattern-forming member is pressed onto the barrier rib forming
9 material.

1 26. The display panel manufacturing process of one of
2 Claims 24 and 25, wherein the bonding agent arranging process
3 is performed by injecting the bonding agent into the
4 indentations using a nozzle.

1 27. (Amended) A display panel manufacturing method,
2 for connecting a pair of substrates arranged in opposition via
3 a bonding agent arranged on a plurality of barrier ribs formed
4 in a specific pattern on at least one of the substrates,
5 wherein a process for arranging the bonding agent on the
6 barrier ribs includes:

7 an attaching process for attaching a bonding agent
8 positioning member to the barrier ribs;

9 a first removing process for removing parts of the
10 bonding agent positioning member attached to the barrier rib
11 tops at positions corresponding to the specific pattern, to
12 form a groove along each barrier rib top;

13 a bonding agent filling process for filling the grooves
14 with the bonding agent, while maintaining the relative
15 positions of the grooves and the barrier rib tops; and

16 a second removing process for removing the remaining
17 bonding agent positioning member.

1 28. (Amended) The display panel manufacturing method of
2 Claim 27, wherein the attaching process is performed by
3 attaching the bonding agent positioning member to the barrier
4 ribs after an even connecting layer is formed on either the
5 barrier ribs or the bonding agent positioning member.

1 29. (Amended) The display panel manufacturing method of
2 one of Claims 27 and 28, wherein the first removing process

3 removes parts of the bonding agent positioning member attached
4 to the tops of the barrier ribs by irradiating the surface of
5 the bonding agent positioning member with a laser.

1 30. Canceled.

1 31. The display panel manufacturing method of Claim 29,
2 wherein a material used for the barrier rib tops absorbs laser
3 light more easily than a material used for other parts of the
4 barrier ribs.

1 32. Canceled.

1 33. Canceled.

1 34. Canceled.

1 35. (Amended) The display panel manufacturing method of

2 Claim 27, wherein the second removing process removes the
3 remainder of the bonding agent positioning member using one of
4 peeling, melting and sublimation.

1 36. (Amended) A display panel manufacturing method, for
2 connecting a pair of substrates arranged in opposition via a
3 bonding agent applied to a plurality of barrier ribs formed on
4 at least one of the substrates, wherein a process for
5 arranging the bonding agent on the barrier ribs includes:

6 an arranging process for bringing an already formed bond
7 sheet into contact with tops of the barrier ribs;

8 a transfer process for transferring the bonding agent to
9 the parts of the barrier rib in contact with the bond sheet by
10 pressing the bond sheet onto the barrier rib tops; and

11 a removing process for separating the bond sheet from
12 the barrier ribs.

1 37. Canceled

1 38. (Amended) The display panel manufacturing method of
2 Claim 36, wherein the transfer process heats the parts of the
3 bond

4 sheet in contact with the barrier rib tops.

1 39. (Amended) A display panel manufacturing method, for
2 connecting a pair of substrates arranged in opposition via a
3 plurality of barrier ribs formed on at least one of the
4 substrates, and a bonding agent applied to the barrier ribs,
5 the display panel manufacturing method comprising:

6 an applying process for applying the bonding agent to an
7 area on each barrier rib that is at least as large as a top of
8 each barrier rib;

9 a hardening process for selectively hardening parts of
10 the attached bonding agent positioned in a central area of the
11 barrier rib tops, when viewed widthwise; and

12 a removing process for removing the parts of the bonding
13 agent that have not been hardened.

1 40. The display panel manufacturing method of Claim 39,
2 wherein, in the applying process, a compound of bonding agent
3 and photo-hardening resin is applied to the barrier rib tops;
4 and

5 in the hardening process, parts of the applied compound
6 are exposed to light, causing the exposed parts of the
7 compound to harden.

1 41. The display panel manufacturing method of Claim 40,
2 wherein a resin that hardens upon exposure to ultra-violet

3 light is used as the photo-hardening resin, and the

4 light used in the hardening process is ultra-violet light.

1 42. The display panel manufacturing method of Claim 41,
2 wherein, in the hardening process, after ultra-violet
3 irradiation has taken place, hardened parts of the bonding
4 agent are heated.

1 43. (Amended) The display panel manufacturing method of
2 any one of Claims 1, 2, 3, 4, 20, 24, 27, 36, and 39, wherein
3 the bonding agent is arranged on the barrier ribs using a
4 compound including a substance which is more difficult to melt
5 than the bonding agent.

1 44. (Amended) A gas discharge panel, including a first
2 substrate, on which a plurality of pairs of electrodes
3 extending in a first direction, and a dielectric layer
4 covering the electrodes have been formed, and a second
5 substrate, on which a plurality of barrier ribs, extending in
6 a second direction differing from the first direction, are
7 formed in opposition to the dielectric layer and the electrode
8 pairs so that the barrier ribs are separated from the
9 dielectric layer and the electrode pairs, wherein the
10 dielectric layer and the barrier ribs are at least partially
11 connected via a bonding agent; and
12 the panel is structured such that discharge mainly
13 occurs in parts of the panel separated from the positions

1 49. The gas discharge panel of Claim 44, wherein a
2 protective film is formed on the surface of the dielectric
3 layer, and the protective film and the barrier ribs are
4 connected; and

5 the parts of the protective layer to which the barrier
6 ribs are connected are thicker than the other parts of the
7 protective layer.

1 50. The gas discharge panel of Claim 44, wherein the
2 parts of the barrier ribs that do not correspond to cells are
3 connected to the first substrate.

1 51. The gas discharge panel of Claim 44, wherein the
2 barrier ribs are at least partially connected to the first
3 substrate by a bonding agent applied to the barrier rib tops
4 so as to cover an area narrower than each barrier rib top.

1 52. (Amended) The gas discharge panel of any one of
2 Claims 44 to 51, wherein gas is enclosed at a pressure of no
3 less than 1.01×10^5 Pa in a space between the first and
4 second substrates.

1 53. A display panel, formed from a pair of substrates
2 arranged in opposition and connected via a bonding agent
3 applied to a plurality of barrier ribs formed on at least one
4 of the substrates, the bonding agent being applied to at least

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5 part of each barrier rib;

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6 wherein a substance having one of a different melting
7 point and softening point from a substance used for the part
8 of the substrate connected to the bonding agent is used for
9 the bonding agent; and

10 the pair of substrates are connected near top parts of
11 each barrier rib.

1 54. The display panel of Claim 53, wherein one of the
2 melting and softening point of the bonding agent is higher
3 than one of a melting and softening point of the parts of the
4 pair of substrates connected to the bonding agent.

1 55. The display panel of Claim 53, wherein one of the
2 melting and softening point of the bonding agent is lower than
3 one of a melting and softening point of the parts of the pair
4 of substrates connected to the bonding agent.

1 56. The display panel of any one of Claims 53 to 55,
2 wherein most of an area near the top parts of the barrier ribs
3 is connected to a substrate.

1 57. (Amended) The display panel of any one of Claims 53
2 to 55, wherein the display panel is a gas discharge panel in
3 which gas is enclosed between the pair of substrates, and the
4 pressure at which the gas is enclosed is set at no less than
5 1.01×10^5 Pa.

1 58. (Amended) The display panel of Claim 56, wherein the
2 display panel is a gas discharge panel in which gas is
3 enclosed between the pair of substrates, and the pressure at
4 which the gas is enclosed is set at no less than 1.01×10^5
5 Pa.

1 59. (Amended) A display panel, formed from a pair of
2 substrates arranged in opposition and connected via a bonding
3 agent applied to a plurality of barrier ribs formed on at
4 least one of the substrates, the bonding agent being applied
5 to at least part of each barrier rib,
6 wherein the bonding agent includes a substance which is
7 more difficult to melt than the bonding agent.